

Zero Retries issue 0190 2025-02-21

Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Radios are computers - with antennas! Now in its fourth year of publication, with 2500+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0190>

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Request To Send

Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

My thanks to **Prefers to Remain Anonymous 65** for *upgrading* from a free subscriber to Zero Retries to an **Annual Paid Subscriber** this past week!

Financial support from Zero Retries readers is a significant vote of support for the continued publication of Zero Retries.

#

Hamshack Hotline Extension 6103420

My Hamshack Hotline extension is now active and I'm looking forward to using it to chat with others over Voice Over Internet Protocol.

I was asked "what's the elevator pitch for Hamshack Hotline?" Reasonable question! This is my perspective:

Hamshack Hotline is a Voice Over Internet Protocol (VOIP) telephone switch that is operated by volunteers for the benefit of Amateur Radio Operators. To qualify for an extension to be allocated, you must provide Hamshack Hotline with an "official" copy of your Amateur Radio license. There's no direct involvement with *radio* in the basic service of Hamshack Hotline (it's all operated via Internet). But as I mentioned in the previous issue,

It's cool that there's some crossover between [Hamshack Hotline and AREDN Meshphone](#). There's also connectivity between [Hamshack Hotline and AllStarLink](#). Experimenting with both of those will have to wait for some additional Amateur Time Units (ATUs) to be allocated.

I can't promise I'll answer every Hamshack Hotline call (currently there's only one phone at my office area in *(frigid,* for most of this past week...) N8GNJ Labs, but feel free to give me a call to say Hello.

#

Nice Mention in Amateur Radio Weekly 369

[Amateur Radio Weekly 369](#) featured an article of mine from Zero Retries 0188 - The Coming 21st Century Amateur Radio Networking Revolution:

Amateur Radio is poised to experience the equivalent of the Packet Radio Revolution, but in the 21st century, with 21st century technology.

I'm grateful for ARW Editor (and Zero Retries Pseudostaffer) Cale Mooth K4HCK for mentions of Zero Retries. The ZR subscriber count always experiences a noticeable uptick after such mentions.

###

Utah Digital Communications Conference This Weekend

For the second year in a row, life events conspired that I could not attend the UDCC (including virtually). I've heard good things about this conference, and it looks like an interesting set of seminars for the 2025 event. It would be great to meet up with the Zero Retries Interesting folks in that part of North America! On Saturday I'll be thinking about all the fun they'll be having there, and hopefully we'll see some video archives of the presentations. Perhaps in 2026, our Amateur Radio travel budget will be a little more accommodating.

###

Returning to Shorts Season

Here at Zero Retries Galactic Headquarters and N8GNJ Labs, our four weeks or so of winter'ish weather (and nearly two weeks of snow *remaining on the ground*) has finally broken. Our winter'ish climate is surprisingly mild given that Bellingham is a mere 20 miles from (brrr...) Canada. This week has featured temps back in the 50s (F) and the usual gray overcast that maintains those temps this time of year. Not only has this weather made N8GNJ Labs (and my office) habitable again (due for an insulation, HVAC, and many other upgrades *this* year), but such temperatures allow me to return to my usual "work" uniform of T-shirt, light jacket, and *shorts*. Honestly, one of the very best perks of semi-retirement is wearing shorts 1 *most* of the time.

The radio projects of the weekend are to test a beta version of software, and dust off my HamWAN microwave radio, change the dish antenna, and test out another piece of beta software on the HamWAN radio. And I really have to get online with VARA FM as that mode has finally begun to penetrate into usage here in Whatcom County. And of course, there are AREDN radios to flash with the latest firmware... and many other fun projects in my queue.

###

Have a great weekend, all of you co-conspirators in Zero Retries Interesting Amateur Radio activities!

Steve N8GNJ

Leave a comment

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Update on M17 Foundation Activities

By Steve Stroh N8GNJ

Excerpts from the [M17 Foundation](#) web page

*The [M17 Project](#) has created a modern digital voice and data / messaging system for VHF / UHF bands, based on open source technology. M17 was designed for Amateur Radio, **by** Amateur Radio. Notably, in my opinion, M17 makes explicit provisions for data and messaging in its protocol, and (unlike DMR) has been specified well enough for multiple implementations of data over M17. All of my activity to use digital voice going forward will be on M17, with perhaps some minor experimentation with D-Star (especially D-Star's data capability).*

The [M17 Foundation](#) is a new organization to guide and promote M17 technology and usage in Amateur Radio. The M17 Foundation is making progress behind the scenes, positioning itself for (hopefully) resuming development work on M17 and related technology in 2025. This is an update based on recent postings on the M17 Foundation website.

Direct Donations to M17 Foundation Now Available

The M17 Foundation now has a [DONATE](#) link at the top right of the [M17 Foundation](#) web page and the [M17 Project](#) page. Those links are a bit *too* subtle, in my opinion. In fact, I suggested that M17 Foundation set up a donation link, having completely overlooked that it already existed.

The link takes you to a PayPal page:

Donate to Fundacja M17

The future of M17 is in your hands. Donate now to secure our existence.

With some suggested amounts.

Apparently in Poland (where M17 Foundation is established), a not for profit or charitable organization cannot have “members” such as similar organizations in the US can. Thus all financial contributions to M17 Foundation are donations.

The future of M17 Foundation really is in the hands of us fans / supporters / users / enthusiasts of M17 technology at the moment through our donations. If we want to see M17 succeed and grow, a strong advocacy organization is needed to coordinate its growth into mainstream use and acceptance.

M17 Foundation / Project Status Update

Wojciech Kaczmarek:

Here’s a word of explanation behind the decision to establish M17 Foundation.

As of December 6th, 2024, the authoritative sources of information regarding the M17 Project are M17 Foundation – m17foundation.org (the legal entity guiding M17 development) and M17 Project – m17project.org (technical information for M17) web pages.

M17 Foundation manages these social media accounts:

- “M17 Foundation” Discord server: <https://discord.gg/xC4ec8k9>
- “@m17_project” on X: https://x.com/m17_project
- “@m17_project” on Mastodon: https://mastodon.radio/@m17_project
- “M17 Project (ham radio)” Facebook group

The group formerly known as the *M17 Project* (prior to December 6, 2024) has been completely dissolved. A number of reasons contributed to this:

- The group did not form any legal entity.
- The group suffered from loose organization and operated uncoordinated, sometimes working at cross purposes.
- Relying on external fiscal sponsors proved to be expensive, unreliable, and did not always “transparently pass through” grant funding to support M17 activities.
- Funds disbursement was not under legal, strict control.
- Our previous website, m17project.org, was hardly seeing any updates. Currently, the website is being maintained.

Most of the personnel based in the US, previously involved with M17, are not affiliated with the M17 Foundation. Also, unfortunately, some of the former M17 personnel decided to keep the assets purchased with grant funds, preventing the M17 Foundation from managing that equipment in alignment with its goals.

All grant funding for M17 through the end of 2024 has been completely disbursed. All the expenses related with the establishment of M17 Foundation (legal work, M17 logo registration, new website hosting) have, to date, been paid for with **personal funds**.

At this moment, the M17 Foundation **needs donations** from those who care about continuing the mission of M17: continuous development of a modern digital voice/data ecosystem for VHF/UHF bands, based on open source technology, specifically for amateur radio.

A roadmap of M17's proposed goals and projects for 2025 and beyond (if sufficient funding is secured) will be published soon.

Future grant funding is not assured, and grant funding is not a long term solution for funding M17 Foundation's work. The Foundation is investigating other (non-grant) funding sources.

The future of whether M17 Foundation will be able to continue the M17 development is in your hands. Please donate to M17 Foundation at the link below, so that we can continue our mission:

https://www.paypal.com/donate/?hosted_button_id=4HTHZCS8UYPU6

M17 Conference 2025

The M17 Conference is planned for September 6-7 (full weekend). No schedule is available yet, but the event will most likely span two days: 9:00-16:00 on Saturday and 9:00-14:00 on Sunday. More details shall be published soon. The admission is free.

Location: [Garnizonowy Klub Oficerski](#), Nowy Dwór Mazowiecki, Poland.

Presentations can be broad-spectrum, but should be radio related. Proposed topics include:

- M17 Protocol
- open-source hardware/software development and sustainability
- reverse engineering and hacking
- GNU Radio uses
- digital RF protocols for amateur radio; efficient use of spectrum
- amateur satellite communications
- amateur radio infrastructure (incl. Radio Access Networks)
- signal intelligence

We are currently accepting presentation and booth proposals. Please fill in and submit the form below **only** if you are interested in participating as a speaker or if you want to have a booth. Regular attendees **do not need** to register.

As the above indicates, the interests of the M17 Foundation, and the M17 Conference are not strictly confined to M17 technology.

On the linked page, there's no mention (yet) of the potential of virtual attendance and presentations, live streaming the conference, or video recording for later viewing. There's also no mention of potential corporate or other sponsorships. But this is a brand new conference, so it's likely that such details will emerge in ample time prior to the conference.

It's encouraging to see M17 Foundation "take charge of its destiny" in setting up its own technical conference. I think doing has a lot to recommend it for other technologies in Amateur Radio, especially now that the TAPR Digital Communications Conference, which acted as a showcase for new technologies and developments in Amateur Radio, has ceased.

To many in Amateur Radio, M17 "just isn't that big a deal; it's just yet another digital voice mode" (of several in use in Amateur Radio). Thus it's hard to get past the "oh yeah, I heard about that a while ago" factor in getting recognition for current M17 activity at other Amateur Radio events. Thus, creating a *dedicated* conference that will showcase *M17 technology* is an effective way to work around that issue.

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AREDN Updates

By Steve Stroh N8GNJ

Excerpts from the [AREDN](#) web page

Amateur Radio Emergency Digital Network (AREDN) is a software (firmware) upgrade for a number of Wi-Fi and Wireless ISP outdoor radio units that can form a self-organizing mesh network on microwave frequencies. The advantage of AREDN over other data systems for Amateur Radio is that AREDN is “native TCP/IP” and high speeds (10 Mbps and faster). AREDN is designed for Amateur Radio, by Amateur Radio and includes Amateur Radio features such as embedded callsigns, lack of encryption, ease of use (minimal configuration), etc. Thus most “Internet” systems (that don’t depend on “cloud services” can be used for Amateur Radio over AREDN networks, including high resolution cameras, Voice Over Internet Protocol (VOIP) telephones, email, web pages, and other services.

The reference below to OLSR is [Optimized Link State Routing](#), and a quick reading of the linked article makes the point that OLSR is optimized for mobile usage, which isn’t quite equivalent to the use case of AREDN; mountaintop and home station microwave nodes don’t move around much, so the “proactive” nature of OLSR isn’t really needed for AREDN.

In the discussion below of “Layer 2” versus “Layer 3”, see the Wikipedia article [OSI model](#) for a detailed explanation, specifically the “Layer architecture” chart.

Introducing a New Network Protocol

By the AREDN Development Team

The AREDN team is introducing a new networking technology into the nightly builds with the ultimate long term goal of replacing OLSR.

OLSR has many faults which AREDN has lived with for a long time. For the last couple of years we’ve been looking at alternatives and making incremental steps in the codebase to allow us to introduce something new. We can finally do that by adding Babel (<https://www.irif.fr/~jch/software/babel/>) to AREDN.

Babel has a number of qualities which make it good for AREDN. First, it’s a loop free protocol so, regardless of how the network is changing, routing loops will never form in the network. Second, it’s primarily a reactive protocol which sends changes to neighbors when needed rather than broadcasting its state continually. Third, the protocol understands the difference between wired, wireless, and tunneled links – the three link types AREDN utilizes. Fourth, it’s a layer-3 routing protocol, which integrates easily with how AREDN already operates. Fifth, it’s highly configurable which will allow an optimal setup for our use case. Finally, it’s simple.

We considered a number of options, and another contender was B.A.T.M.A.N. Advanced. Unfortunately this protocol is not a good fit for AREDN as it primarily focuses on level-2 wireless networking. AREDN needs a protocol which can do more. We evaluated how we could use BATMAN and it wasn’t simple, efficient or pretty.

If you’re interested in more comparisons between Babel and other options there are many good presentations on YouTube. [[Babel Doesn't Care + Slides - BattleMeshV8](#)] is a great primer on Babel itself.

Babel will roll out into the nightly builds alongside OLSR and the two will operate in parallel. If there is a Babel-only path between two nodes in the network, then Babel routes will be used to send traffic. If not, then OLSR routes will be used. This will let us deploy Babel and examine its performance in our networks without disturbing nodes which are not running Babel.

Important: Be aware that older radios with limited memory – the ones using the tiny firmware images – will not be able to support both protocols and should be eventually replaced.

Evaluating success will depend on a few things, and the more feedback from the community the better. Our goals are to provide a more stable network, better routing decisions, and lower network overhead. Assuming success, the time scale to replace OLSR will be measured in years. Once OLSR is gone, any node not running Babel will disconnect, and we don't want to leave our users behind so we are giving this as much time as needed for the transition to the newer protocol.

AREDN nightly build 20250217, which includes the Babel protocol, is now available.

The only other thing that's changed in this build compared to the 3.25.2.0 production release is the addition of an icon that shows if a link is running the Babel protocol. It looks like this:

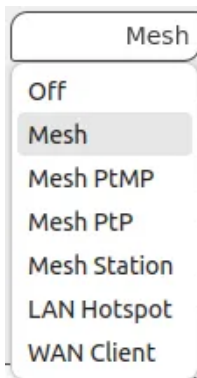


Go forth and test (cautiously)!

[New Experimental Radio Modes and SSID](#)

From the AREDN website:

Following on the heels of the inclusion of the Babel routing protocol to the AREDN software is another significant enhancement: nightly build 20250219 adds PtP (Point to Point) and PtMP (Point to MultiPoint) configurations. These protocols can be found in the Radio section of the AREDN UI:



Here's a brief explanation of each of them:

- **Mesh PtMP:** This makes a node act like your common access point, where Mesh Station nodes can connect to it, but not to each other, and the Mesh PtMP can only connect to Station nodes.
- **Mesh PtP:** Same as above except only a single Station is permitted to connect, specified by a MAC address.
- **Mesh Station:** Can connect to a Mesh PtMP or, if it's the authorized node, a Mesh PtP. It cannot connect to anything else.

The new modes also require a new SSID. This changed SSID is a necessary by-product of how these modes are implemented. Our current Mesh uses the WiFi Ad-Hoc radio mode, while these new modes use the WiFi Infrastructure (sometimes called Manager) radio mode. Infrastructure Stations will connect by matching the appropriate SSID, without regard for any channel setting. Therefore, to make sure Stations connect to their correct end-point, we encode the channel in these new SSIDs. For example, if you have a Mesh PtMP node on channel 175 at 10 MHz, the SSID would be AREDN-175-10-v3.

Consider this feature EXPERIMENTAL. We are releasing it for feedback from the community. We know that Infrastructure radio mode is better supported and we suspect it provides better compatibility between vendors compared to AdHoc mode, and supports higher bandwidths. We'd like to get feedback from the community to see if this is true, if this is useful, and if it's worth the support costs of including this in future releases.

The use of OSLR in AREDN, and the load it imposes on the network has been a "rich topic of discussion" among network experts in Amateur Radio and advocates of other microwave network architectures. In my opinion, those concerns... while valid... are distinctly secondary to AREDN's ease of use of within Amateur Radio. Most Amateur Radio Operators aren't networking experts, so AREDN's "plug and play" nature has gotten many more Amateur Radio Operators using microwave networking than previous, and other microwave networking systems. Thus, the AREDN developers being able to address the shortcomings of OLSR without abandoning AREDN's historical ease of use, is definitely a win for Amateur Radio.

Similarly, the (currently experimental) addition of Mesh PtMP, Mesh PtP, and Mesh Station settings makes AREDN even easier to configure and build microwave networks without extensive network knowledge. While it's always been possible to build AREDN networks with a combination of automatic mesh networking, and static links, such information was often "tribal knowledge" rather than "configure from the menu", so this addition is a welcome change, in my opinion.

Greater Use of 44Net Addresses in AREDN

The addition of **Enabled 44NET LAN configurations** in [AREDN Production Release 3.25.2.0](#) is, in my opinion, *significant*. A brief explanation from a previous mention in a non-production build:

LAN NAT & 44NET modes. You can now use ARDC's 44net subnets as a device's LAN addresses. We've also improved LAN NAT to support larger address ranges.

By default, AREDN uses the [10.0.0.0/8 Private IP address space](#) and [Network Address Translation \(NAT\)](#), which (by

design) is not routable outside of an AREDN network.

Thus, in my opinion, there are several “wins” for the use of 44Net addresses in AREDN:

- 44Net IPv4 addresses are assignable to individual Amateur Radio Operators / systems. Thus a “system wide service” for AREDN would be traceable and “knowable” to an individual Amateur Radio Operator or group.
- 44Net IPv4 addresses are (generally) static. They don’t change, or at least, change slowly, thus more “stable” (depending on the application, that’s sometimes preferred behavior).
- 44Net IPv4 addresses are routable on the Internet. For some AREDN applications, that could be a “feature”. An example is making a high resolution camera on a mountaintop AREDN node viewable from the Internet.
- ARDC has mentioned periodically that it is developing a 44Net Virtual Private Network (VPN) service; integrating that service with AREDN (Internet) tunnel servers and clients would (potentially) be a powerful combination.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

Upcoming Events Countdown

- [Utah Digital Communications Conference](#), 2025-02-22 in Sandy, Utah, USA *tomorrow*.
- [HamSCI 2025](#), 2025-03-14 and 15 in Newark, New Jersey, USA in **4 weeks**. [Registration for HamSCI 2025 is now open](#). Tina KD7WSF and I will attend this event. I hope to meet up with any Zero Retries readers that are also attending HamSCI 2025 to talk about all things Zero Retries Interesting.
- [Southeastern VHF Conference 2025](#), 2025-04 and 05 in Clarksville, Tennessee, USA in 6 weeks. [More details in an email list message](#).
- [LinuxFest Northwest 2025](#), 2025-04-25 thru 27 in Bellingham, Washington, USA in 9 weeks. The largest Linux conference in the Pacific Northwest. No direct involvement with Amateur Radio, but I’ll be attending and learning.
- [Four Days In May 2025](#) - 2025-05-15 in Fairborn, Ohio USA (in conjunction with Hamvention 2025) in 13 weeks. *The biggest and best QRP (low power operation) event in the world!*
- [Hamvention 2025](#) - 2025-05-16 thru 18 in Xenia, Ohio, USA in 13 weeks. I will be attending this event. I hope to meet up with any Zero Retries readers that are also attending Hamvention 2025 to talk about all things Zero Retries Interesting.

###

ESPARGOS: ESP32-based Wi-Fi Sensing Array (YouTube)

Louis Mamakos WA3YMH in a Comment on Zero Retries 0189:

Here's some amazing work that this community might be interesting:

ESPARGOS: ESP32-based WiFi sensing array

Develop and deploy WiFi sensing applications effortlessly: ESPARGOS is a phase-coherent ESP32 antenna array.

It's worth the 10 minute time investment watching the video:

and <https://espargos.net/>

I had seen mentions of this video in various places, and I was a bit skeptical to allocate time to watch yet another new YouTube channel, but when WA3YMH, as a reader of Zero Retries, knowing what I try to promote here in Zero Retries, said

It's worth the 10 minute time investment watching the video.

Then I should take the hint from a Zero Retries reader and watch it. And I did. And wow... if anything, WA3YMH *undersold* this video.

Putting aside the technological *brilliance* of the system (which I'll get to in a moment), this video is the most amazing demonstration of basic antennas that I've ever seen. One of the toughest parts of Amateur Radio to get across to a new Amateur Radio Operator is understanding the effective difference of various types of antennas - omnis, beams, dishes, circular polarization, eggbeaters, folded dipole ground planes, etc. But when "Jeija" (no other attribution available, that I could find) switched from his mobile phone to the beam antenna and started showing that there was almost no radiation from the side of the beam, and all the energy was focused in one direction by the elements of the beam, *just in a those few seconds of that part of the video, you get it about the effectiveness of beam antennas versus omni antennas*. You can look at polar charts in books and articles, you can see animations of beams versus omnis... but there is *nothing* like seeing this live demonstration of visualizing *actual* radio emissions using different antennas. Not to mention the demonstration of reflectivity, attenuation, and all the other vagaries of radio energy that Amateur Radio Operators eventually intuit... but is so hard to teach without actual hands on experience. If you're trying to teach hands-on radio technology in a classroom setting... you really need one of these systems for your classroom. If you do, your students will really start getting it about radio energy and antennas.

If the radios you're trying to use in the array *are* hackable, then you can feed them with the same clock to achieve phase coherence. That's the approach taken for the five radios in the [KrakenSDR](#) which can be used for automatic direction finding.

Thus I was still skeptical about this project because ESP32's are designed... not to be good... but to be *cheap*. So how do you phase lock a bunch of cheap chips, each with internal, individually variable Phase Lock Loops (PLLs) when

you cannot access that PLL? Brilliant answer... *you don't need to*. All you need to do to get reliable, phase coherent performance out of a cheap ESP32 is that you only need to know what the individual chip's *variation* (from a reference) is. So their technique of calibrating each of the chips, finding out the individual chip's variance is, and put that into a lookup table²... is *brilliant*.

This project is accomplished with some brilliant engineering to work around the vagaries of a <\$2 microcontroller with 2.4 GHz Wi-Fi. Thus imagine *how much more capable* a "better" system can be, using a variety of Software Defined Receivers (for different frequency bands), with faster interfaces, with faster host computers, etc. In my opinion, we're a few years away at most in pairing a portable host computer, a virtual reality headset, and a radio array like ESPARGOS and you're going to be able to walk around a building and *literally see the radio energy*. Propagation planning is one thing, but putting up a Wi-Fi AP and walking around a new building and being able to *see* whether the Wi-Fi is getting to all the corners of the building that you expect it to. Getting reports of low signal in a place? Put on the headset and *go look* at the radio problem.

Again... *brilliant!*

On the [ESPARGOS](#) website:

At the Institute of Telecommunications at the University of Stuttgart, we have manufactured a small batch of ESPARGOS devices and have already provided some to partners for evaluation, primarily research project members and other research institutions. At this point, we have no more prototype boards left to send, sorry 😞. The hardware design and firmware files of ESPARGOS are currently not open source, but the pyespargos library including the demo applications are Free Software.

I am now preparing a manufacturing run for ESPARGOS. This involves some PCB redesigns to make the design more mass-manufacturable, to get the cost further down, and to get it certified. This will obviously take some time. So sign up for email updates to stay up to date!

I predict that this technology *will change things* about understanding, using, and maintaining radio systems, especially in classroom settings.

On a personal note... learning incredibly interesting stuff like this energizes me to keep going in writing Zero Retries and sharing it with all of you Zero Retries readers.

##

[Testimony for Yaesu FTM-6000R as a \(Higher Speed\) Data Radio](#)

Stephen Smith WA8LMF on the VARA-MODEM email list:

I have tested end-to-end VARA-FM FAST links with a pair of FTM-6000s and they work perfectly. Effortless connect at 22K-plus speeds. I have had a mix of SignalLinks, DigiRigs and my homebrew interfaces in the test setups.

The main headache is the doofus non-standard TEN-pin miniDIN port on the rear. It combines the 6-pins of the industry-standard 6-pin mini-DIN data port, and 4 conductors of an actual physical RS-232 serial port (not USB) for memory programming and cloning, on one connector.

Yaesu sells a forked cable that breaks out the 10-pin mini-DIN into both a standard female 6-pin mini-DIN data port and a DB-9 serial port for around USD \$40. I buy 10-pin-male-to-10-pin-male mini-DIN cables for USD \$7 a pop, cut them in half and then splice a cable with a 6-pin female mini-DIN connector to each half. Net result is that I get TWO cables for under USD \$20.

My Panasonic Toughbook laptops have an actual physical RS-232 DB9 serial port on them. I have successfully used this with the embedded serial port on the FTM-6000 DIN port to clone the memory load of one FTM-6000 into four others. No hassle with virtual COM ports over USB drivers.

Note that once you get around this cable nuisance, that the FTM-6000 properly implements both the "1200 baud" (de-emphasized RT audio) and the "9600 baud" (raw discriminator audio) RX connections of the mini-DIN data port. Its internal menus also properly switches the TX-in audio bandwidth properly for

both 1200 and 9600 baud modes on transmit. (The 9600-baud TX mode is required for VARA-FM FAST.)

Another nice feature of this radio is that it only consumes about 140 mA on standby receive compared to around 1 amp for most mobile radios. Nice for battery-backed standby in remote locations.

Yaesu WAS having an end-of-model-life clearance sale NOV-through-JAN. Most of the major ham dealers were selling them for USD \$259. I snapped up 4 of them in December. I don't know if there are any left at some of the dealers.

The FTM-6000R is my current recommendation for a 144-148 MHz / 440-450 MHz data radio because of the feature that WA8LMF describes - the flat audio connection enabling higher speed operation.

I have no idea if in fact Yaesu has declared the FTM-6000R “end of model life” as WA8LMF states. There’s no such indication on [Yaesu’s FTM-6000R product page](#), [Ham Radio Outlet’s FTM-6000R product page](#), or [DX Engineering’s FTM-6000R product page](#) (though it does say “Only 7 left in stock”).

But, *just in case*, I ordered a second FTM-6000R today so I’ll be able to do similar testing and usage as WA8LMF does, reducing the variability of testing of audio interfaces by using two of the same radios, as I can also do with the several Kenwood TM-V71As that I have in N8GNJ Labs.

#

[Russia Is Hijacking US Military Satellites](#) (YouTube)

The US Military operates several communication satellites with open repeaters, meaning any signal they receive gets rebroadcast. This has been exploited by various groups, including Russian users around Ukraine. I checked out some of these signals on various webSDR streams, some of which you can find below.

This is a good discussion by Gabe Emerson KL1FI of the exploitation of the US military’s (originally the US Navy) “GEO Repeater” satellites - FLTSATCOM and UFO, including examples of usage by Russian-speaking users. By design (in the era of these satellite’s design and launch) there is no security built into the satellites - *no authentication of user access*. They’re just very high vantage point repeaters, very lightly used, and really easy to access. All of that is well explained in the video.

Hackaday’s take - [The US Military’s Unsecured UFO Satellites and Their Use by Russia](#) - offers some additional context:

Something that you generally don’t expect as a North-America-based enthusiast, is to listen in on Russian military communications during their war in Ukraine via WebSDR, or that these communications would be passing through US military satellites that are happy to just broadcast anything. Yet that’s the situation that the [Saveitforparts YouTube channel recently described](#). As it turns out, there is a gaggle of UFOs up there, as the US DoD lovingly calls them.

Between 1979 and 1989 eight [FLTSATCOM](#) launches took place, with FLTSATCOM 7 and 8 still operating today. They were later joined by their successor UHF Follow-On ([UFO](#)) with 11 launches between 1993 and 2003. All of these operate in the UHF spectrum, with some UFO satellites also covering other bands. Their goal is to provide communication for the military’s forces, with these satellites for the most part acting as simple repeaters. Over time non-military parties learned to use these satellites too, even if it’s technically illegal in many jurisdictions.

As described in the video, if you listen in on WebSDR streams from Ukraine, you can find not only encrypted military comms, but also unencrypted Russian radio traffic. It seems that in lieu of being provided with proper (encrypted) radio systems, Russian forces are using these US military satellites for communication much like how US (and NATO) forces would have. This is reminiscent of how Russian troops were caught using Discord via Starlink for communication, before [Russian command shutdown Discord](#).

In **Zero Retries 0012**, I did a thought experiment about US Amateur Radio Operators using these (US Military)

satellites in kind of an “auxiliary” capacity. See:

Brave? Yes. Experimenters? Maybe.

and

Thought Experiment - Amateur Radio Use of FLTSATCOM.

If there are (apparently, inevitably) going to be “secondary users” of FLTSATCOM, perhaps it's worth consideration that US Amateur Radio Operators would be better “secondary users” of FLTSATCOM than “Brazilian pirate users”. There's some precedent in such an idea of sharing spectrum and interoperating between US government and US Amateur Radio Operators - the [sharing of the 60 meter \(5 MHz band\) between FEMA and US Amateur Radio Operators](#) and of course, the [Military Auxiliary Radio System \(MARS\)](#). There's also some precedent in the US Military turning over a satellite to Amateur Radio use. In 2017 the US Air Force Academy [transferred control](#) of [FalconSAT-3](#) to Amateur Radio operators (some accounts say control was transferred to AMSAT-NA).

Why US Amateur Radio operators? First, the FLTSATCOM satellites were launched, owned, and operated by the US Department of Defense. Second, US Amateur Radio Operators generally respect the rule of law and especially cooperation with US military regarding shared spectrum. One recent example is an [interference issue within the shared military / Amateur Radio 420 - 430 MHz band in New Mexico](#).

I still hope (*Irrational Exuberance...*) that US Amateur Radio Operators could get access to FLTSATCOM for some experimentation in the Western Hemisphere with Geosynchronous operations, especially at the UHF frequencies of FLTSATCOM. Some of the work Amateur Radio is beginning to do for new paradigms in VHF / UHF, such as M17, IP400, and others would probably work amazingly well on FLTSATCOM.

Suggested contacts, anyone?

###

Current Active AMSAT Engineering Projects

From ANS-047 AMSAT News Service Weekly Bulletins:

AMSAT's GOLF project is targeting a launch NET (no earlier than) 1Q 2026 for GOLF-TEE, a 3U CubeSat carrying a V/u linear transponder, an X band SDR based downlink, and an active attitude determination and control system. The follow-on GOLF-1 is currently targeted for a launch NET 1Q 2027.

AMSAT's Fox Plus project is also proceeding towards being ready for a launch of a 1U CubeSat (Fox-Plus-A) with a V/u linear transponder. AMSAT's Fox-Plus-B is also proceeding with the AMSAT XBT as the core transponder technology. AMSAT's XBT is intended to break down the barrier between linear and FM transponders using modern signal processing and SDR. It will be capable of providing simultaneous multiple channel operation using multiple modes. All modes will be simultaneously supported from CW through SSB through narrow band FM through PSK31 (BPSK, QPSK and such) and even SSTV. The signal processing portion of the transponder will be reconfigurable in orbit and the initial design is as a traditional U/v (non-inverting) configuration.

AMSAT's Fox-Plus-B satellite is also expected to fly AMSAT's PACSAT payload.

I'm really glad to see some plans for AMSAT-US satellites that will be more Zero Retries Interesting than orbiting FM repeaters and APRS digipeaters. The “XBT” sounds very interesting. PACSAT... *be still my heart!*

AMSAT-US could create some goodwill and cultivate interest if they were to release those designs so they could be replicated as “Groundsats” and experienced in the near term in some areas that had the technical chops (and terrain) to host such “terrestrial payloads” rather than waiting years for a potential launch and activation of a satellite.

###

Open Source D-Star using Codec 2

In “The Firehose” mention (see next section) of the PocketPacket app, I looked up [Antony Chazapis SV9OAN’s QRZ page](#) and found this mention:

My work on D-STAR includes Estrella, an open-source, software-only radio for [macOS](#) and [iOS](#), and associated [server software](#) and [utilities](#), that enable D-STAR communications using [Codec 2](#). If you are interested in D-STAR, check [my paper](#), “Extending D-STAR with Codec 2”, published at the 38th ARRL/TAPR DCC, 2019.

In my discussions here in Zero Retries about M17’s use of Codec 2, several people made reference that there was “work done to retrofit D-Star to use Codec 2” instead of the (proprietary) AMBE CODEC used in all Icom and Kenwood D-Star capable radios. But no one (that I recall) ever pointed me to that actual work (and I didn’t attempt to look do the research), but now there’s a solid reference. In preparing this issue of Zero Retries, I didn’t have time to read SV9OAN’s entire paper, but the intro paragraphs are a good overview of how the “retrofit” of Codec 2 was handled.

SV9OAN’s paper was also a good reminder that despite M17 being the first *fully open source* digital voice / data radio system for VHF / UHF / repeater operation by Amateur Radio for Amateur Radio...

The distinction of being the *first* digital voice / data radio system designed for VHF / UHF / repeater operation *by Amateur Radio for Amateur Radio* belongs to [Japan Amateur Radio League \(JARL\)’s development of D-Star](#) (PDF).

Despite the impression one gets when considering Amateur Radio units, Icom is not the sole source of D-Star radios. Kenwood also makes radios capable of D-Star, including the forthcoming TM-D750A. There are also numerous software implementations of D-Star, including Multi Mode Digital Voice Modem (MMDVM).

#

[Linux's Sole Wireless/WiFi Driver Maintainer Is Stepping Down](#)

Days after a DRM driver developer orphaned his drivers due to health reasons in stepping down, the sole maintainer at large of the Linux wireless (WiFi) drivers is stepping down and without any immediate replacement.

Kalle Valo who has been a Qualcomm Atheros engineer for more than the past decade and contributor to the Linux kernel since 2008 during the Linux 2.6 kernel days has decided to step down.

Ruh Roh. Insert the oft-quoted, and deadly accurate XKCD comic [DEPENDENCY](#).

Leave a comment

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The Firehose

By Steve Stroh N8GNJ

*The Firehose (as in trying to drink from a...) will be a periodic feature in...or perhaps entire issues of... Zero Retries Interesting items that I just couldn't fit into an issue of Zero Retries... but have begun to age out and no longer topical for a **newsletter**. My bookmarking system is getting too clogged of “maybe I can mention this...” with (too) many items not making it week after week, aging into month after month. Thus I'll keep diving into the bookmarks and either they'll get a full mention or story, included in a Firehose article or issue, or marked “declined”.*

*Most newsletters don't have this issue - they're constantly starved for material. But after 3.5+ years, I've spread a wide net for Zero Retries Interesting material, and unlike a lot of newsletter editors, I'm not afraid to write most of the material if necessary. **Amateur Radio Daily** has a similar problem, and it publishes [“Overdrive” issues](#), and was the inspiration for The Firehose.*

[WoAD](#) - Android app for Winlink

WoAD can be used as a client of the Winlink Global Radio Email® system or for direct connection to a peer-to-peer (P2P) capable client, via either the internet or one of several over-the air protocols.

#

PocketPacket - IOS and MacOS app for APRS

PocketPacket is a full-featured APRS client with a built-in TNC. The "Automatic Position Reporting System" is a packet communication protocol used by amateur radio operators (hams) around the world, to report position, status, station capabilities, weather or other information in real time. Packets can also be used for broadcasting announcements or one-to-one messaging.

PocketPacket incorporates a software-based TNC, allowing you to directly capture and visualize, or encode and transmit 1200 baud packets (AFSK modulation) using a VHF radio transceiver.

#

The SatNOGS Network has reached 11 Million Observations!

The SatNOGS Network has achieved an incredible new Milestone! It has reached its eleven-millionth observation, and we are wholeheartedly grateful to the entire Community for this achievement!

#

ARDOP on iPhone (Amateur Radio Digital Open Protocol)

Discussion on the ARDOP Developers email list about continuing Development of ARDOP, and potentially ARDOP being available on iPhone (RadioMail) and Android (WoAD).

#

Foundations of Amateur Radio - Finding your path in this hobby

Onno Benschop VK6FLAB:

As you might recall, recently I stumbled on an excellent list of 52 weekly challenges put together by Fabian, DJ5CW and friends. You can find it at hamchallenge.org. As I've previously mentioned, it contains activities right across the amateur spectrum, from designing a QSL card to making a contact on 80m or 160m, with everything in between. It's an excellent tool to set a weekly goal to achieve and I recommend that you have a go.

It's in my queue to offer a Zero Retries version of these "first steps", such as "set up a beacon on APRS, get online with a DigiPi, etc., but I keep deferring that story, so I'm putting this mention into the Firehose.

#

Checking Out The Discovery Dish - A Simple & Easy-To-Use Satellite Antenna For Everyone! (YouTube)

The Discovery Dish is a simple, lightweight satellite antenna that can use various feeds for different radio bands. I tested out L-band (1.7GHz, S-band (2.2GHz, Inmarsat (1.5GHz) and H1 (1.4GHz). I found the antenna to work really well for L-band satellites like NOAA and Meteor, and OK for weaker satellites like Metop. It also works great for geostationary GOES satellites.

#

A Bit of FreeDV's New RADE V1 Mode Heard on 40m

A great thing about digital voice is the lack of band or interference noise. You can see quite dramatic

selective fading but the speech is perfectly readable.

FreeDV is under active development and the new RADE mode is a big step up on past modes.

My thanks to Amateur [Radio Weekly 367](#) for this pointer.

#

[Getting Started with AREDN](#)

We have long been interested in Data Networking and Amateur Radio. One of our projects this past year has been to build a [Homelab](#). This project builds on the [fiber optic-based data network](#) and includes a high-availability virtual server setup. These interests made our recent inclusion of [AREDN](#) (Amateur Radio Emergency Data Network) network capability in our station a natural addition. This post explains how we got started with AREDN.

My thanks to Amateur [Radio Weekly 367](#) for this pointer.

Leave a comment

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Comments Summary From Previous Issue

Comments from Zero Retries 0189

- I neglected to mention IBM Token Ring in the Local Area Network technologies I ~~suffered through~~ *had experience with*.
- Discussion of [The Packet Radio RF Forwarding Network](#).
- ESPARGOS: ESP32-based WiFi sensing array; discussed in depth above in ZR > BEACON.

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See the **Zero Retries Boilerplate** page for significant acknowledgements and other information relevant to Zero Retries. For new readers of Zero Retries, that page, and the **About Zero Retries** page has useful information to check out.

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Jack Stroh, Late Night Assistant Editor Emeritus

Shrek Stroh, Late Night Assistant Editor In training

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Footnotes for this Issue

To see the relevant sentence for the footnote, just click the footnote number.

[1](#)

Shorts are amazingly common most of the year here in Western Washington. At least I don't wear open toed sandals with thick socks which is the other amusing wardrobe choice often seen around here.

[2](#)

To be fair, I learned of this technique, using cheap sensors with variable characteristics, at a former employer. Stimulate a cheap sensor with calibrated inputs, learn the individual sensor's variances, then compensate the data from that sensor with the calculated variance / offset in software / firmware. The result is a cheap, but reliable and repeatable sensor.